



Status of LC0_043: LOFAR Survey of Nearby Galaxies

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LC0_043 Overview

Science goals:

- Galaxy spectra (thermal absorption, losses of CR electrons, ...)
- Far-infrared correlation at low frequencies
- Cosmic-ray propagation in outer disks and halos
- Extent of magnetic fields in outer disks and halos
- Search for magnetic fields in compact galaxy groups
- Search for diffuse polarised emission / Faraday rotation from the galaxies and the Milky Way foreground
- Search for polarised emission / Faraday rotation from background sources, to prepare for “RM grids”
- Compact sources in the starburst region of NGC3079
- Search for RRLs in M31 and M82 (LBA and HBA)
- Search for transients in M31, M33, M81/82 and IC342



LC0_043 Overview

- 28 authors (from the MKSP, SKSP and TKSP groups)
- Requested: 160 h nighttime observations and 450 h CEP2 (6 galaxies in LBA, 11 galaxies + 2 galaxy groups in HBA; 8 h each)
- Received: 112 h observations and 213.5 h CEP2
- Scheduled:
3 galaxies in LBA, 8 galaxies + 1 galaxy group in HBA
- M31 and M33 are only observable at nighttime after end of September: DDT time will be applied
- Science teams working on the data sets:
Bochum, Bologna, Bonn, Cracow, Dwingeloo, Nijmegen, Southampton



Observation schedule

Target	Band	Observer	Requested time	Observed Date	UTC Time	LST Range
M31	HBA (110-190)	Giessuebel	8h DDT	26 Sep. 2013 ?	----	----
	LBA (30-88)	Giessuebel	8h DDT	27 Sep. 2013 ?	----	----
M33	HBA (110-190)	Paladino	8h DDT	9 Oct. 2013 ?	----	----
	LBA (30-88)	Paladino	8h DDT	10 Oct. 2013 ?	----	----
M51	HBA (110-190)	Mulcahy	8 h	22 Apr. 2013	20:00 – 04:00	10:30 – 18:30
M81/M82	HBA (110-190)	Adebahr	5 h	6 Mar. 2013	21:26 – 02:30	08:52 – 14:00
			5 h	30 Mar. 2013	19:00 – 00:20	08:00 – 13:21
	LBA (30-88)	Adebahr	5 h	21 Feb. 2013	21:05 – 02:10	07:40 – 12:46
			5 h	31 Mar. 2013	19:00 – 00:00	08:04 – 13:05
NGC891	HBA (110-190)	Mulcahy	Cycle-1	----	----	----
	LBA (30-88)	Mulcahy	Cycle-1	----	----	----
NGC3079	HBA (110-190)	Sotomayor	Cycle-1	----	----	----
NGC4631	HBA (110-190)	Sotomayor	8 h	9 Apr. 2013	18:00 – 02:00	07:40 – 15:41
NGC6946	HBA (110-190)	Jurusik	8 h	15 Jul. 2013	20:00 – 04:00	16:02 – 00:04
IC342	HBA (110-190)	Mulcahy / v.Eck	5 h	2 Feb. 2013	15:50 – 20:50	01:09 – 06:10
			5 h	13 Mar. 2013	22:20 – 04:00	10:14 – 15:55
	LBA (30-88)	Mulcahy or Adebahr	5 h	30 Jan. 2013	16:00 – 21:00	01:07 – 06:08
			5 h	21 Feb. 2013	16:00 – 21:00	02:34 – 07:35
M101	HBA (110-190)	Heald / Toribio	8 h	26 Jun. 2013	15:00 – 23:00	
NGC3627/3628	HBA (110-190)	Drzazga / Paladino	4 h	19 Mar. 2013	22:00 – 02:30	10:17 – 14:48
			4 h	2 Apr. 2013	21:20 – 01:30	10:30 – 14:40
IC10	HBA (110-190)	Heesen	8 h	25 Aug. 2013	19:00 – 03:00	17:48 – 01:49
	LBA (30-88)	Heesen	8 h	26 Aug. 2013	19:00 – 03:00	17:48 – 01:49
Holmberg 124	HBA (110-190)	Nikiel-Wroczynski	Cycle-1	----	----	----
Stephans Quintet	HBA (110-190)	Nikiel-Wroczynski	8 h	19 Aug. 2013	20:00 – 04:00	18:20 – 02:22



Observation details

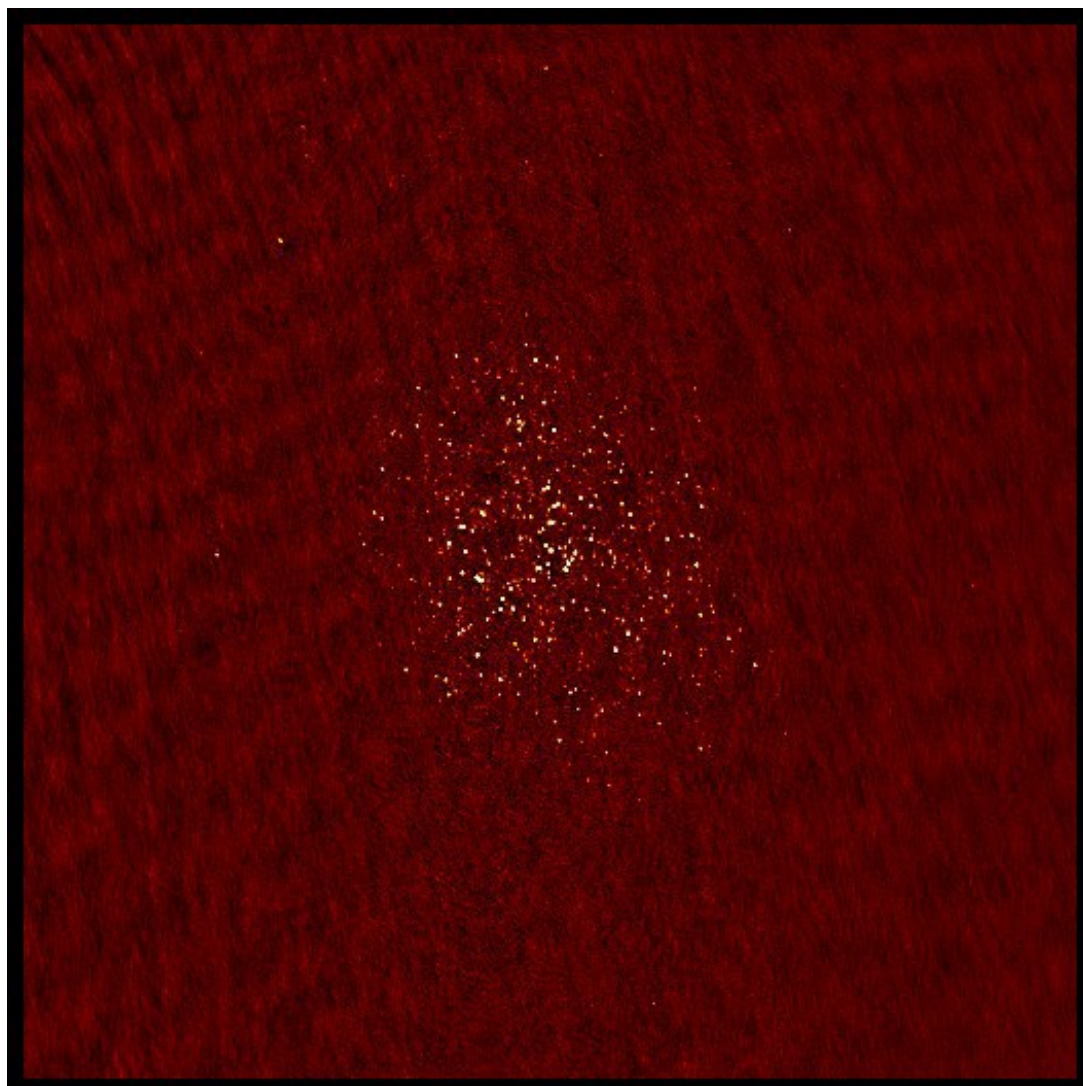
- Several observations split into two epochs to share with the Transients KSP
- High spectral resolution on M81/M82 for RRL
- Amplitude calibration:
 - dual-beam (all LBA and M51, M101 in HBA)
 - switching, 12 min on target and 1 or 2 min on calibrator
- All observations with 8-bit mode
 - full frequency coverage (except for dual-beam in HBA)
- Raw data stored for off-site pre-processing and later analysis
- (Pre-)processed at CEP2 or in Bonn or in Nijmegen
- Pre-processed with high(-ish) resolution for full FoV imaging and to search for polarisation



Leo Triplet (NGC3627/8) - full FoV

- 1 subband
- Basic pipeline calibration
 - gain transfer from calibrator
 - phase calibration on gsm skymodel
- Only core stations imaged
- Some problems with RFI

R. Paladino

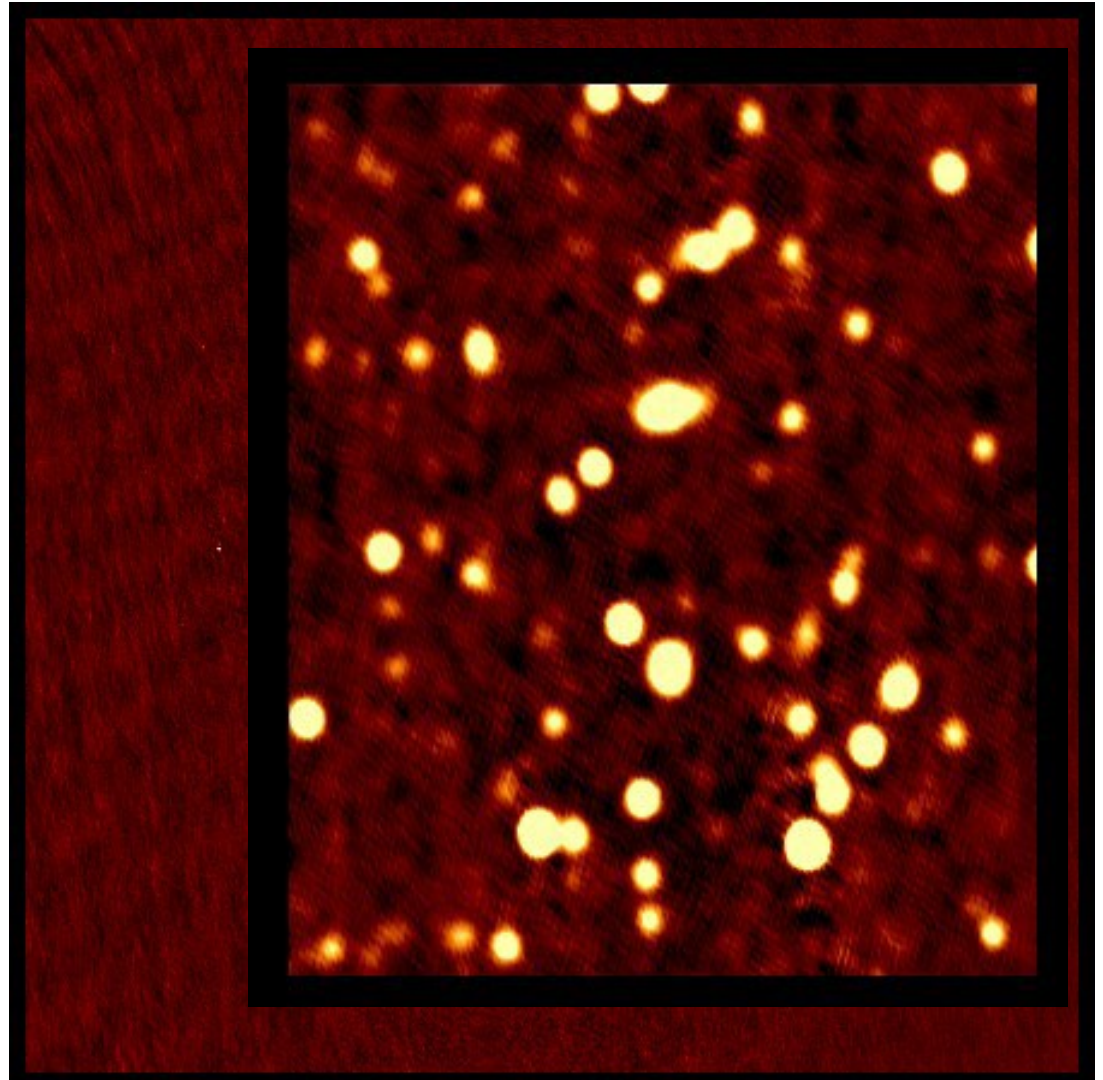




Leo Triplet - zoom

- 1 subband
- Basic pipeline calibration
 - gain transfer from calibrator
 - phase calibration on gsm skymodel
- Only core stations imaged
- Some problems with RFI

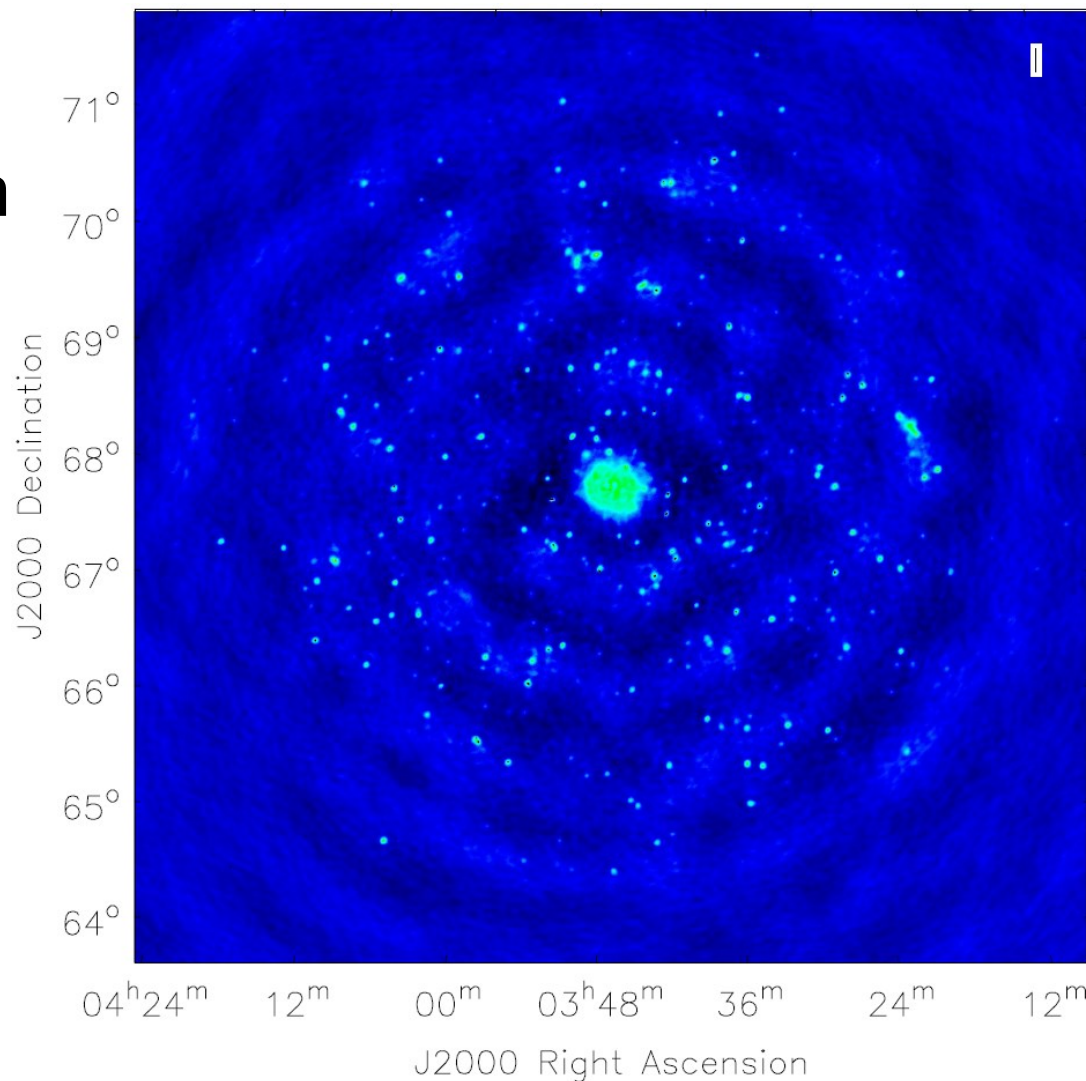
R. Paladino





IC342 - full FoV

- 1 subband
- Basic calibration
 - calibration on gsm skymodel

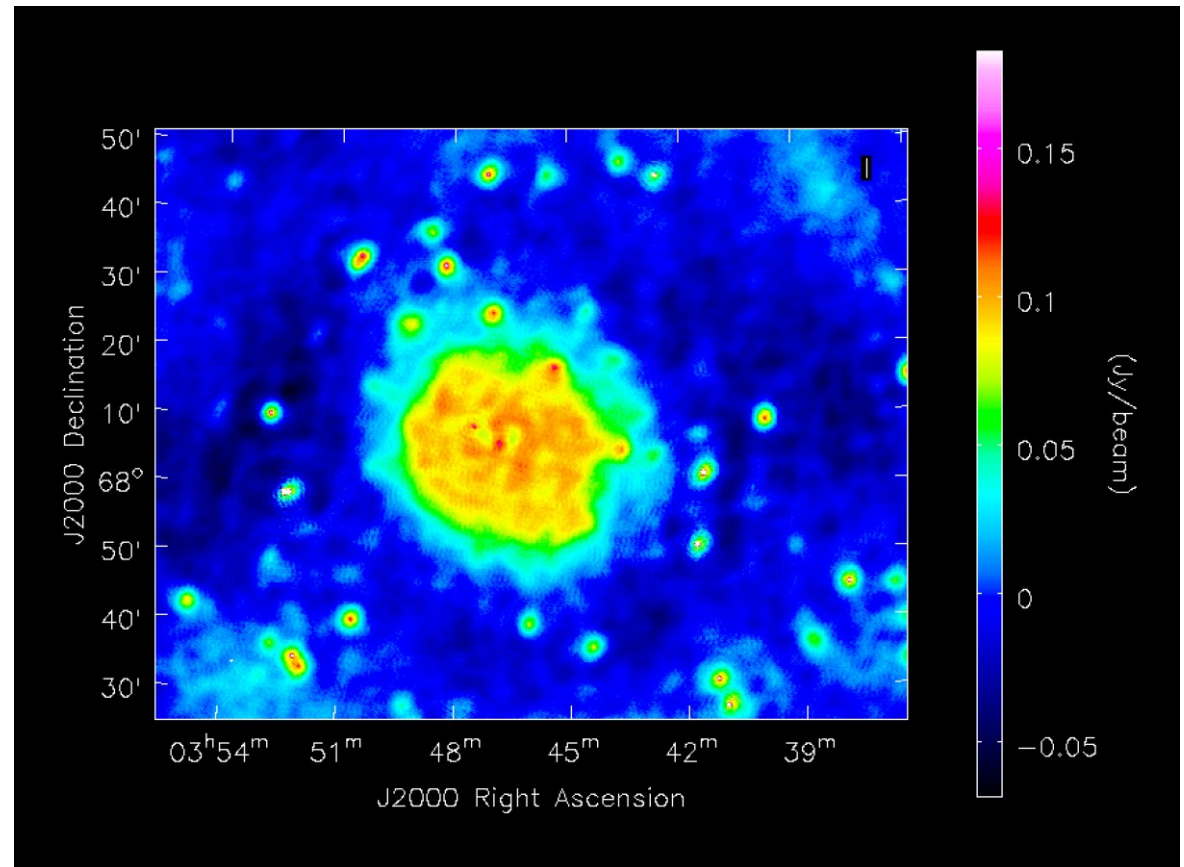


D. Jones



IC342 - zoom

- 1 subband
- Basic calibration
 - calibration on gsm skymodel

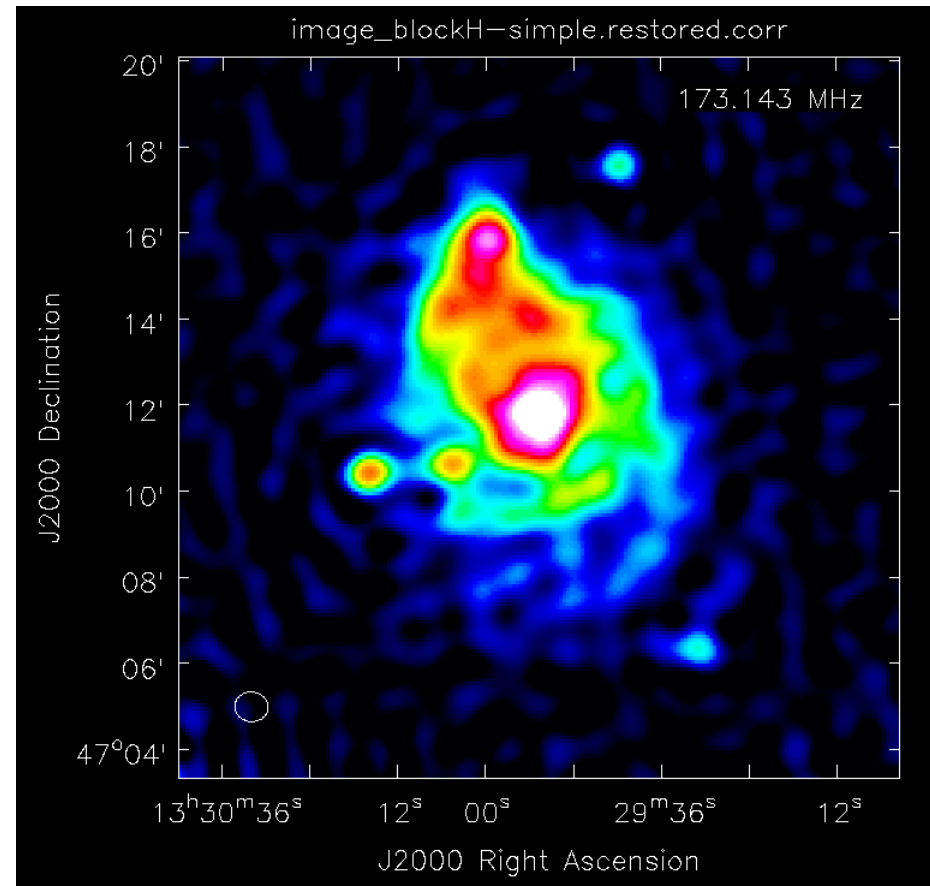




M51

First image with Cycle 0 data

- 1 “block” of 30 SBs
 - 6 MHz bandwidth
- Basic calibration
 - gain transfer from calibrator
 - phase calibration on gsm skymodel
- Uniform weighting, max. baseline 6 km



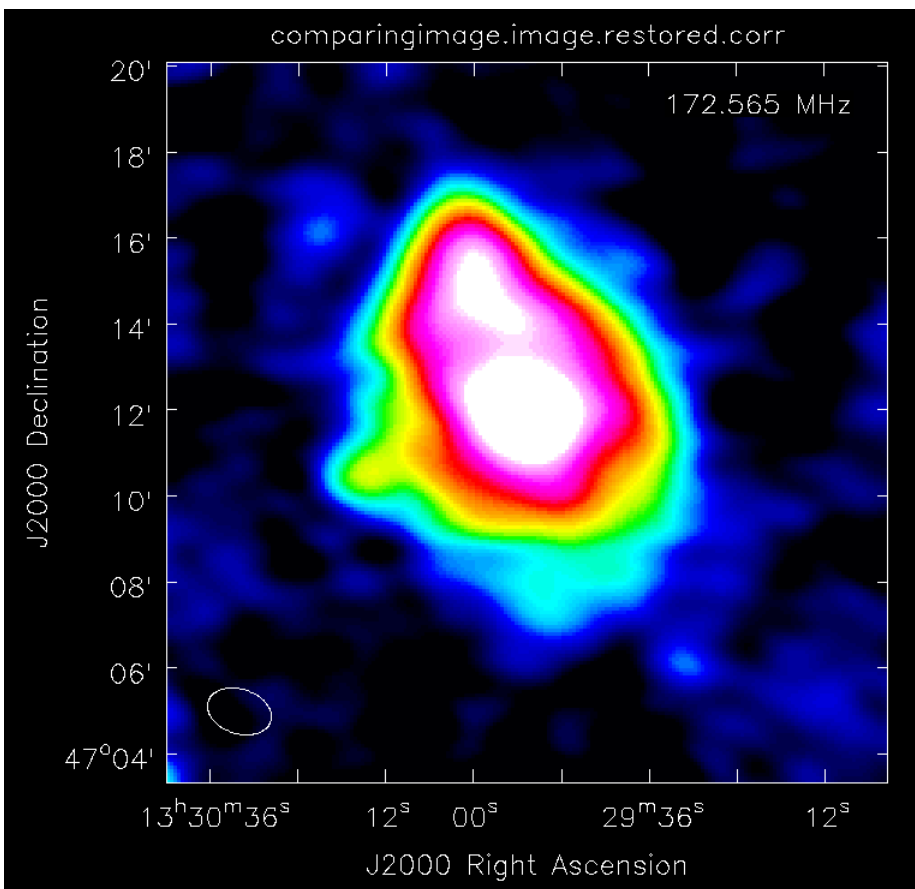
D. Mulcahy and A. Horneffer



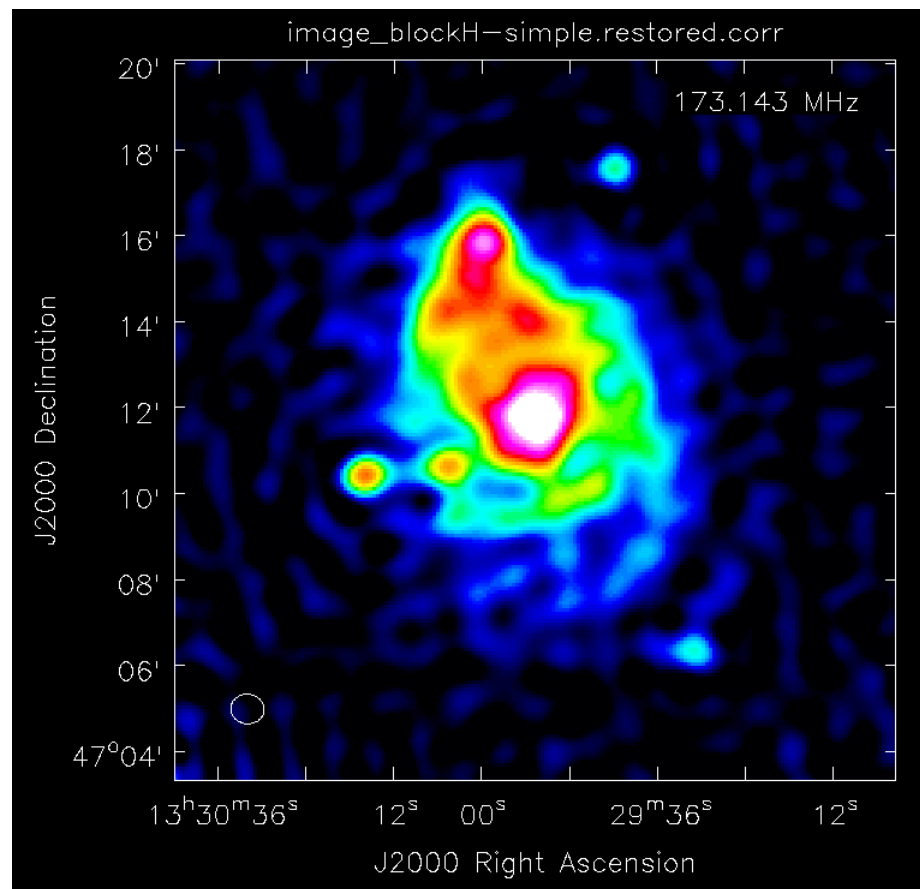
M51

April 2012 / April 2013 data

Comparison after same calibration steps and imaging parameters,
BW: 4 MHz (left) / 6 MHz (right), rms noise: 15 mJy / 4 mJy



D. Mulcahy



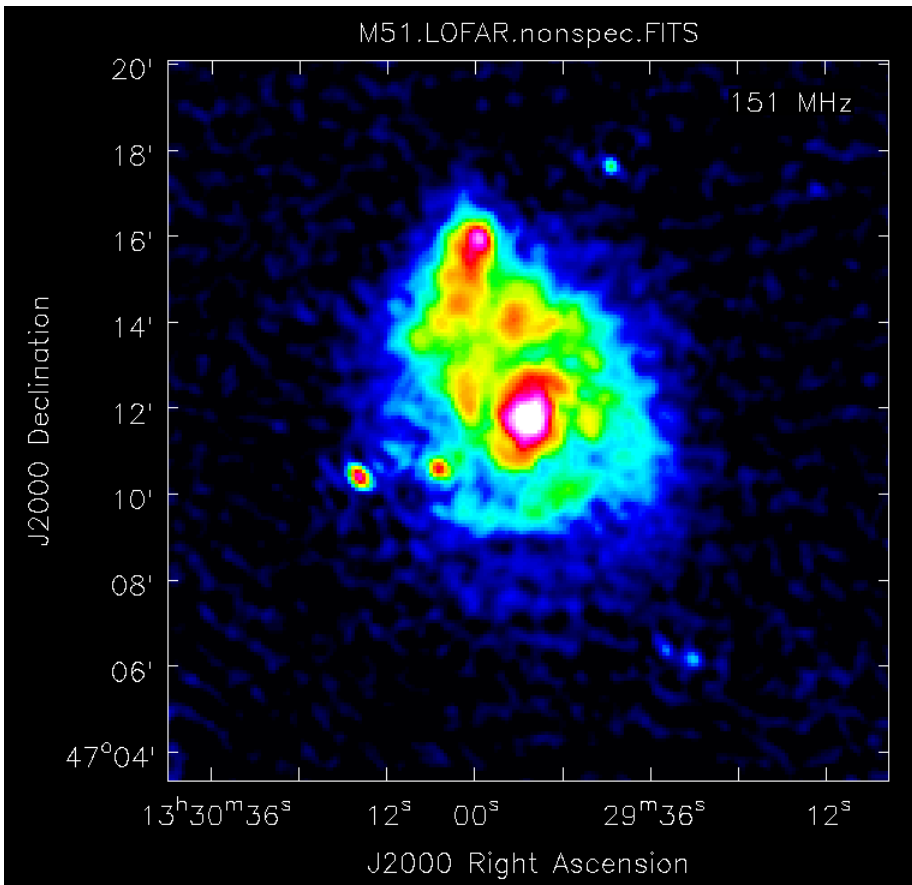
D. Mulcahy and A. Horneffer



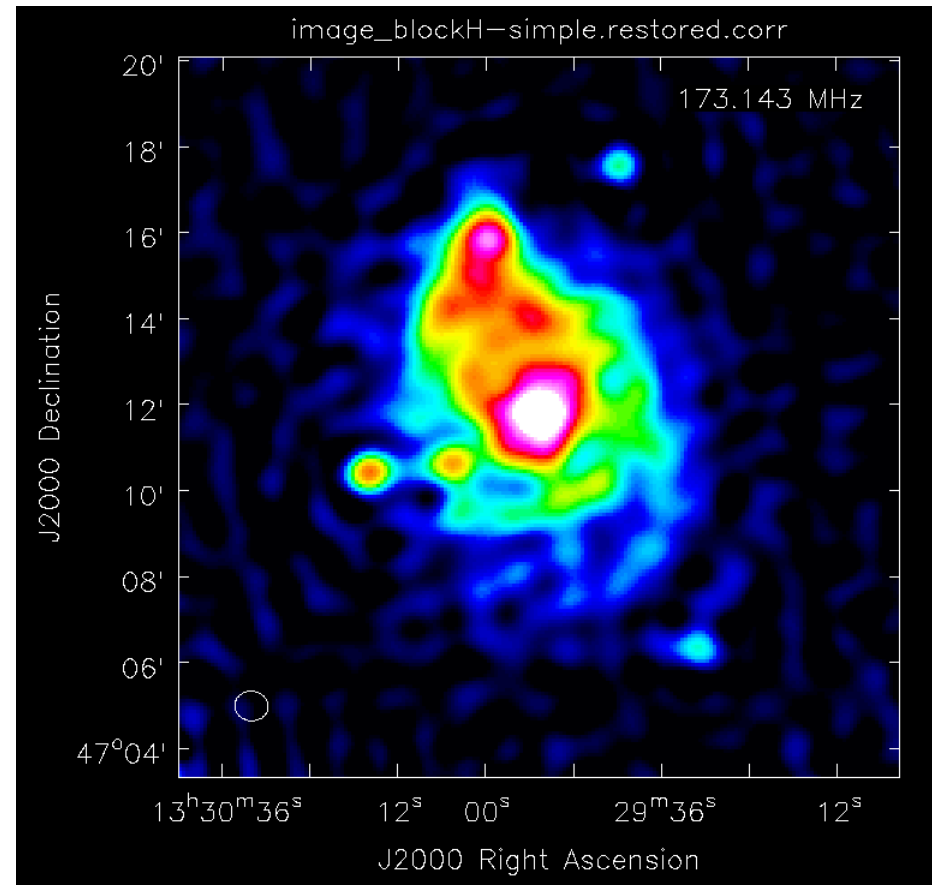
M51

April 2012 / April 2013 data

Comparison with long baselines and full bandwidth,
12 k λ (left) / 6 km (right), BW: 35 MHz / 6 MHz, rms noise: 1.3 mJy / 4 mJy



D. Mulcahy

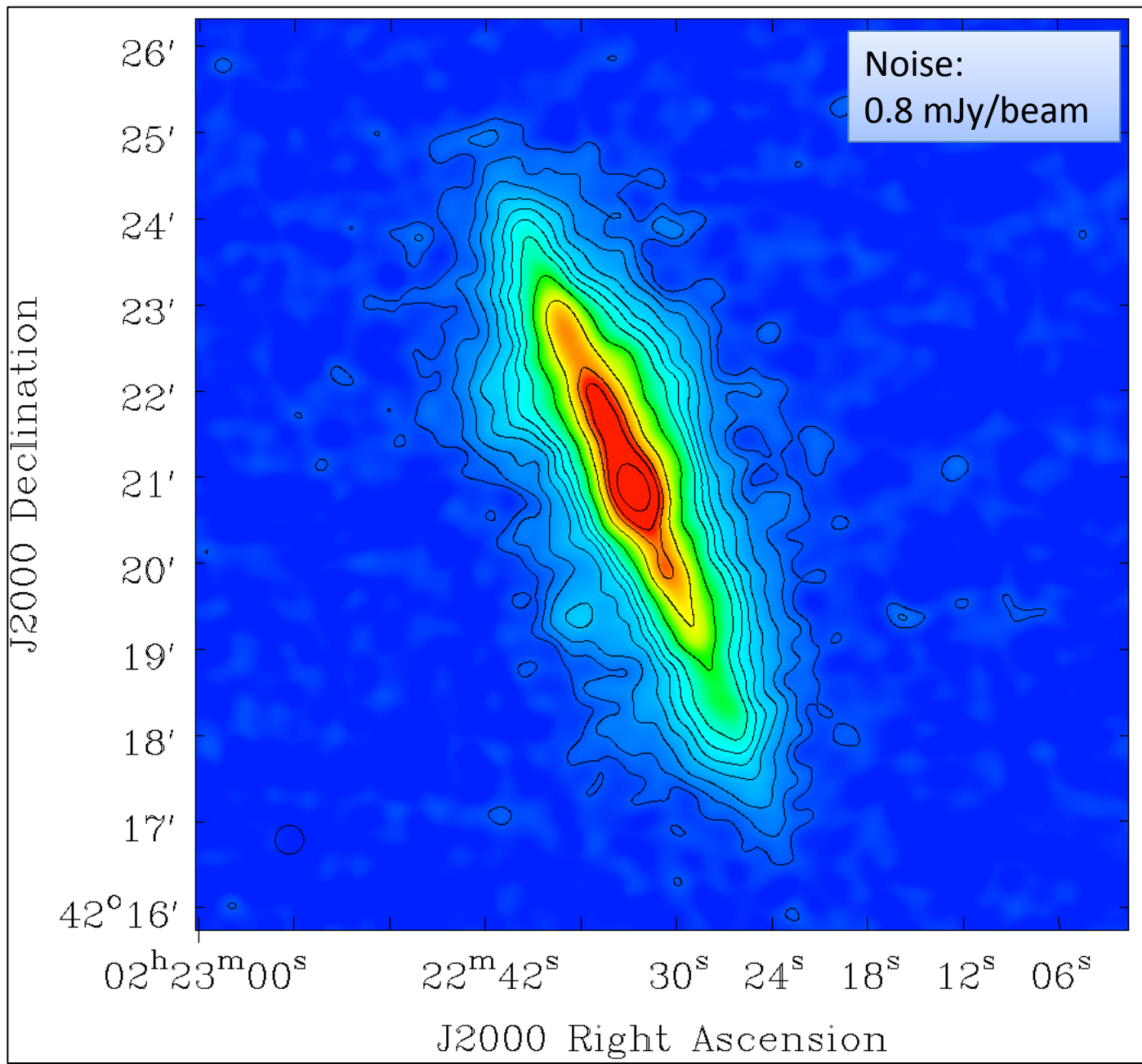


D. Mulcahy and A. Horneffer

Commissioning project on polarisation calibration: NGC891 field (David Mulcahy & Andreas Horneffer)



HBA@150 MHz, 20" beam,
uniform weighting;
noise in 1 subband: 6 mJy/beam (at
156 MHz),
noise for whole bandwidth (48.8 MHz,
244 SBs): 0.3 mJy/beam (in quiet area)





Preliminary conclusions

- Data quality has much improved
 - first results are very promising
- “Automatic” processing is anything but automatic
 - CEP2 has some non-processed subbands
 - cluster at MPIfR Bonn needs upgrade
 - Nijmegen cluster needs faster LTA access
- Need more computing resources and manpower (but who doesn't?)
 - Working on getting LOFAR processing at Jülich compute center to work
 - New PhD students will join end of the year